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Four interesting aphyllophoroid species in the tropical northern region of Veracruz, Mexico

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Abstract—The taxonomic study presents four aphyllophoroid fungi from the Tamiahua region of Veracruz in a tropical deciduous forest dominated by *Quercus oleoides*. *Gloeodontia discolor*, *Hydnochaete paucisetigera*, and *Thelephora dentosa* are recorded for the first time for Mexican mycobiota, and *Gloiothele lactescens* is reported for a new location.

Key words—*Basidiomycota*, clavarioid, corticioid, new records, taxonomy

Introduction

The 1260 ha of land known as Ejido Estero de Milpas (21°14′52″N 97°28′29″W) in the municipality of Tamiahua lies within the Tamiahua Lagoon region in northern Veracruz State, Mexico. The climate is tropical and the area is covered primarily by halophytic vegetation, cattle ranches, tall semi-evergreen forests, and an ecosystem in which tropical oaks are well represented, especially *Quercus oleoides* and *Q. glaucescens* (Registro Agrario Nacional 2016).

Aphyllophoroid fungi are an unofficial basidiomycete assemblage representing such diverse fungi as corticioids, polypores, and clavarioids (Kunttu & al. 2014); they are widely distributed in temperate and tropical forests and play an important role in the degradation of organic matter. This group includes terricolous, parasitic, and ectomycorrhizal species, although little is known about them in the tropics of Mexico. Studies devoted to Mexican tropical aphyllophoroid fungi include Valenzuela & al. (2007, 2011, 2012a,b), Cifuentes & al. (2005), Raymundo & al. (2008, 2009), Medina-Jaritz & al. (2012), Ramírez-López & al. (2013), Ramos-Sosa & Cappello-García (2014), and Ávalos-Lázaro & al. (2016). Our recent survey of the mycobiota surrounding Tamiahua Lagoon in Veracruz, Mexico, revealed several interesting aphyllophoroid collections, described and illustrated below.

Materials & methods

Samples collected in the Ejido Estero de Milpas, municipality of Tamiahua, Veracruz, during July 2014 were described macroscopically from both fresh and dried material. Free-hand thin vertical sections of basidiocarps were mounted in 3% aqueous KOH, Melzer's reagent, Congo Red 1% aqueous solution, phloxine, Cotton blue, and/or sulfobenzaldehyde for microscopical examination using a light microscope. Drawings were made with the aid of a drawing tube. The specimens are preserved in the herbarium of Instituto de Ecología A.C., Xalapa, Veracruz, Mexico (XAL).

Taxonomy

Gloeodontia discolor (Berk. & M.A. Curtis) Boidin,
Cahiers de la Maboké 4 (1): 22 (1966) PLATES 1A; 2A–D

BASIDIOME annual, resupinate, adnate, effused, membranous, sometimes fimbriate under the lens, ≤20 cm lengthwise, thin, in section 30-70 µm thick excluding aculei, yellowish white to grayish yellowish, HYMENOPHORE odontoid to hydnoid, aculei usually slender, pointed at apex, ≤3.5 mm long.

HYPHAL SYSTEM dimitic; skeletal hyphae 1.5–3.5 µm diam., clamp-connections absent, yellowish, smooth, thick-walled (≤1.7 µm), becoming thin-walled and sometimes heavily encrusted with hyaline crystals at the apex in the aculei, non-amyloid, non-dextrinoid; generative hyphae 1–2.5 µm diam., with clamp connections, yellowish, smooth, thin to slightly thick-walled (≤0.8 µm), non-amyloid, non-dextrinoid. GLOEOCYSTIDIA (26–)28–80(–90) × (5–)6–10 µm, narrowly clavate-cylindrical to subulate, sometimes sinuous, with basal clamp connections, often with an apical bead, thin-walled, hyaline, turning dark blue to black on application of sulfuric acid in sulphovanillin. BASIDIA 15–22 × 3.5–4.5 µm, cylindrical, sometimes slightly sinuous, with a basal clamp, with four sterigmata. BASIDIOSPORES (3–)3.5–4.5 × 2.5-3 µm, ellipsoid to ovoid, sometimes adaxially flattened, with a slightly thickened wall, distinctly verrucose, pale yellow, strongly amyloid.

HABITAT—on dead wood of *Quercus oleoides* Schltdl. & Cham. in tropical (*Fagaceae*) deciduous forest; 6–25 m asl.

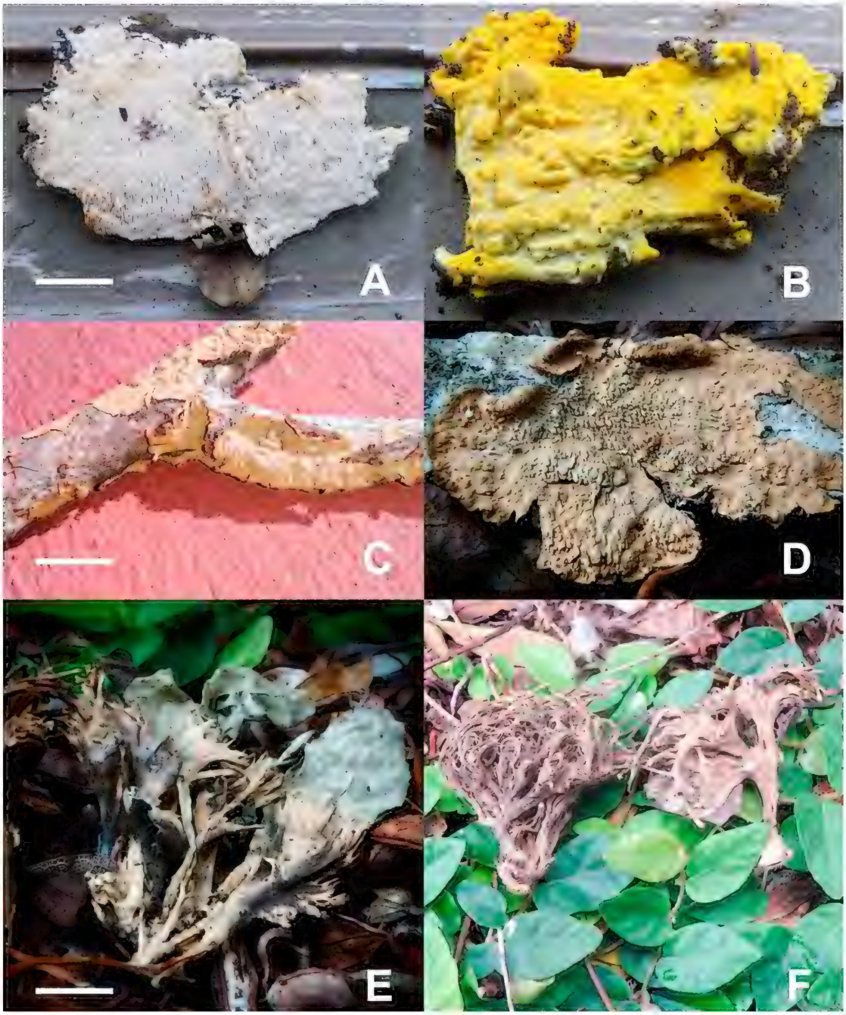

Plate 1. Basidiomata. A. ***Gloeodontia discolor***; B. ***Gloiothele lactescens***; C, D. ***Hymenochaete paucisetigera***; E, F. ***Thelephora dentosa***. Scale bars: A = 14 mm; B = 8 mm; C, E = 10 mm; D = 5 mm; F = 13 mm.

Specimen examined—**MEXICO, Veracruz State, Municipality of Tamiahua,** Ejido Estero de Milpas, 8 July 2014, F. Tapia & D. Jarvio 3149-B (XAL).

Remarks—The diagnostic characteristics of *Gloeodontia discolor*—resupinate, adnate, effused, odontoid to hydnoid hymenophore, sulphopositive gloeocystidia measuring 35–70 × 6–10 µm, dimitic hyphal system with incrusted hyphal ends, and basidiospores that are amyloid, verrucose, and 3.5–4.5(–5.5) × 2.5–3(–3.5) µm (Boidin 1966, Burdsall & Lombard 1976, Hjortstam & Ryvarden 2007)—match those observed for our material.

Macroscopically, *G. discolor* is somewhat similar to *G. columbiensis* Burt ex Burds. & Lombard, which differs by its shorter aculei (usually 0.5 mm long), monomitic hyphal system without clamp connections, and larger basidiospores (5.5–6.5 × 3.5–4(–4.5) µm; Burdsall & Lombard 1976). *Gloeodontia discolor* has been recorded from the subtropical to tropical regions of U.S.A., South America (Brazil, Venezuela), and Africa (Ivory Coast, Kenya, Tanzania) (Boidin 1966, Burdsall & Lombard 1976, Maekawa 1999, Hjortstam & Ryvarden 2007, Zhou & Dai 2013). Our collection represents the first record of *G. discolor* from Mexico.

Gloiothele lactescens (Berk.) Hjortstam, Windahlia 17: 58 (1987) PLATES 1B; 2E–H

≡ *Corticium lactescens* (Berk.) Berk., Outl. Brit. Fung.: 274 (1860)
≡ *Gloeocystidiellum lactescens* (Berk.) Boidin, Compt. Rend. Hebd. Séances Acad. Sci., Paris: 1668 (1951)
≡ *Vesiculomyces lactescens* (Berk.) Boidin & Lanq., Mycotaxon 16: 493 (1983)

HABITAT—On dead wood of *Licaria capitata* (Cham. & Schlecht.) Kosterm. (*Lauraceae*), in tropical deciduous forest; 6–25 m asl.

SPECIMEN EXAMINED—**MEXICO, VERACRUZ STATE, Municipality of Tamiahua,** Ejido Estero de Milpas, 8 July 2014, F. Tapia & D. Jarvio 3159 (XAL).

REMARKS—Our new Mexican specimen of *G. lactescens* was readily identified by its larger, sinuous gloeocystidia (sometimes septate from the middle to the base); basidiospores that are weakly amyloid, smooth, broadly ellipsoid, 6.5–8 × 4.5–6.5 µm; and hymenium with numerous paraphysoid hyphae. Those characters—together with the resupinate, adnate, effused basidiome, whitish or watery gray to yellow or pale straw yellow hymenial surface that is ceraceous and slightly hygrophanous, and cracked dried older specimens—match the descriptions of Eriksson & Ryvarden (1975, as *Gloeocystidiellum lactescens*), Maekawa (1994, as *Vesiculomyces lactescens*), Ginns & Freeman (1994), Wu (1996), Boidin & al. (1997), and Bernicchia & Gorjón (2010).

Gloiothele lactescens is morphologically similar to *G. tropicalis* (Burds. & al.) Ginns & G.W. Freeman, distinguished by its narrower (4–5 µm) basidiospores, and *G. citrina* (Pers.) Ginns & G.W. Freeman, which differs

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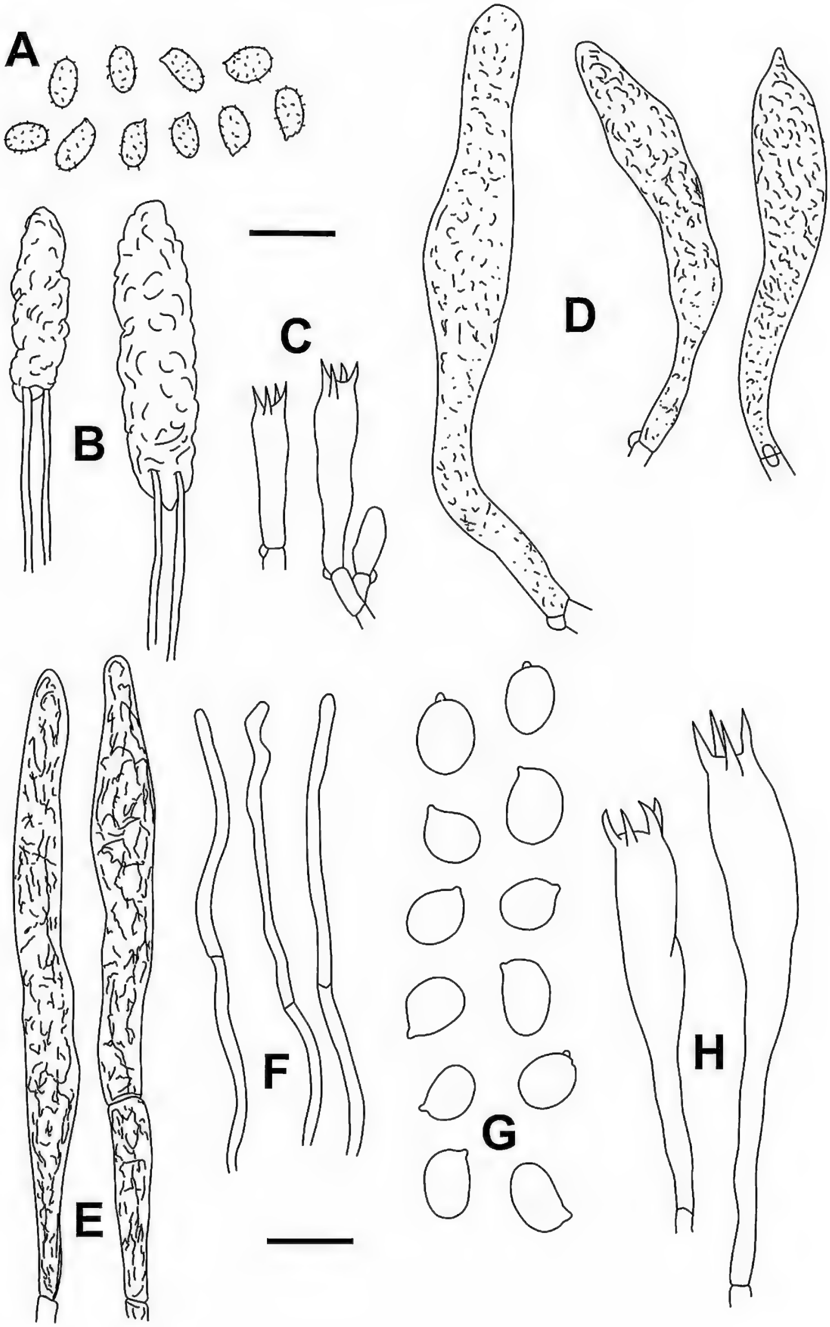
PLATE 2. ***Gloeodontia discolor*** A. basidiospores; B. encrusted hyphae; C. basidia; D. gloeocystidia. ***Gloiothele lactescens*** E. gloeocystidia; F. paraphysoid hyphae; G. basidiospores; H. basidia. Scale bars: A–D = 4.5 µm; E–H = 6 µm.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by its larger (7.6–8.8 × 5.8–7.0 µm) basidiospores; both *G. tropicalis* and *G. citrina* are further distinguished by having no to few hyphidia (Ginns & Freeman 1994).

According to Freeman (1978), *G. lactescens* is widely distributed in many temperate and subtropical regions of the world, mainly in Europe, North America, and Taiwan. Burt (1926) originally reported the species from Mexico (as *Corticium lactescens*) from inland central Veracruz state, and Welden & Lemke (1961) and Guzman (1975) recorded *G. lactescens* from Nuevo León state; here we report it from a new locality, northern coastal Veracruz state.

Hymenochaete paucisetigera (Parmasto & Sheng H. Wu) S.H. He & Y.C. Dai,
Fungal Diversity 56: 90 (2012) PLATES 1C–D; 3A–E
≡ *Hydnochaete paucisetigera* Parmasto & Sheng H. Wu, Mycotaxon 91: 461 (2005)

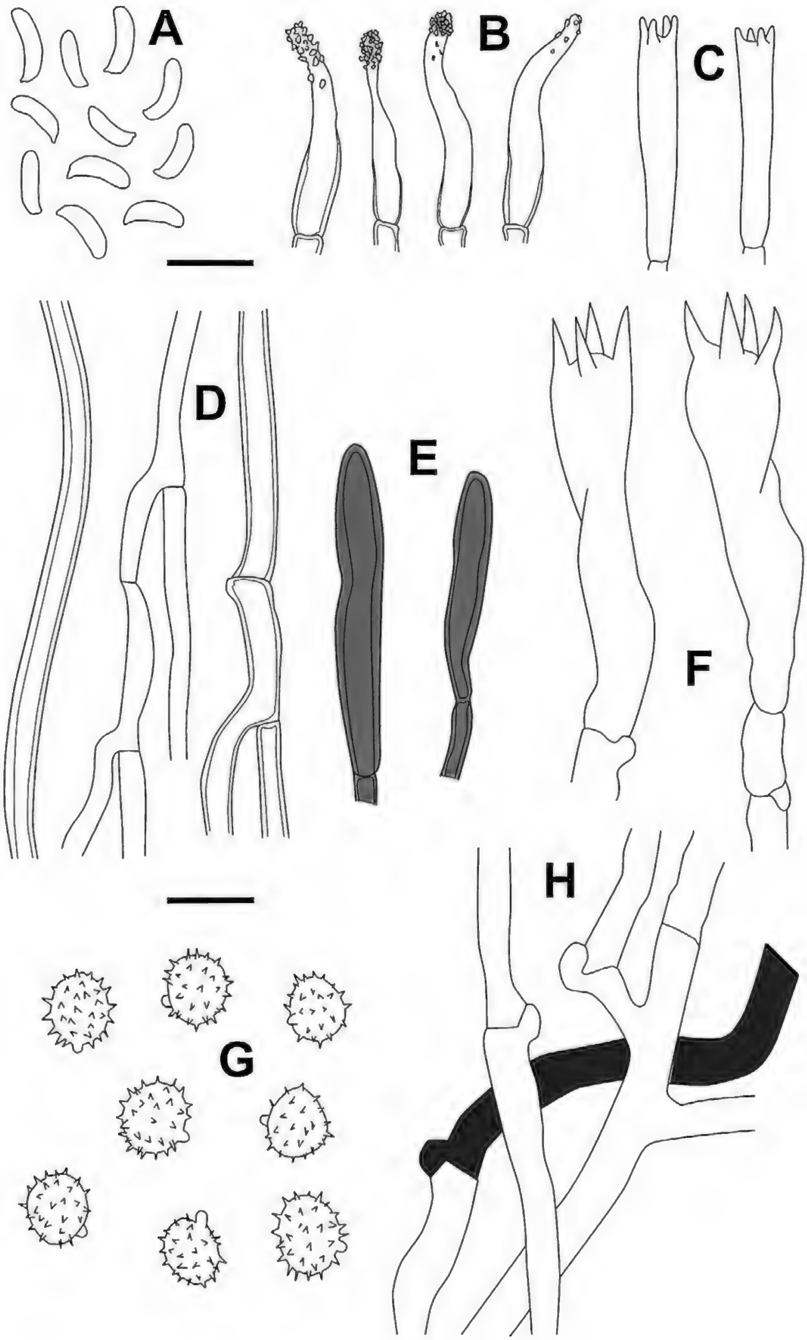
BASIDIOME annual, resupinate, effused-reflexed to pileate, sometimes imbricate, flexible, coriaceous or woody hard. PILEI semicircular to conchate, lifted ≤0.7 mm, ≤2 cm wide, 0.5–1 mm thick, with wavy margin. PILEAL SURFACE dark umber to dark brown, velutinous to tomentose, with concentric zones. HYMENOPHORE hydnoid, pale tan, buff-yellow, or yellowish brown, olive-tinged when dry; aculei irregularly shaped: slightly flattened, tapered, or cylindrical; often solitary, some confluent, 0.5–1.5 mm long. CONTEXT thin, ≤1.5 mm thick, separated from tomentum by a thin black line.

TOMENTUM well developed, 70–180 µm thick; cortex present, ≤40 µm thick; hyphal layer ≤200 µm thick. HYPHAL SYSTEM dimitic; generative hyphae simple septate, hyaline to pale yellowish, thin to slightly thick walled, often branched, 1.5–3.5 µm diam; skeletal hyphae yellow to yellowish brown, thick-walled, 2.5–4 µm diam. SETAE very rare, confined to the hymenium, dark brown, distinctly thick-walled, with blunt tips, 24–40 × 4–7(–9) µm. HYPHIDIA abundant, 15–20 × 1.5–3 µm, hyaline pale to yellowish, thin-walled, tips occasionally encrusted with small resinous granules. BASIDIA 12–25 × 3–4.5 µm, clavate, with four sterigmata. BASIDIOSPORES 4–5(–5) × 1.2–1.8(–2) µm, narrowly cylindrical, curved, hyaline, inamyloid, thin-walled, smooth.

HABITAT—On branches of *Quercus oleoides* in tropical deciduous forest; 4–25 m asl.

SPECIMEN EXAMINED—**MEXICO, VERACRUZ STATE, Municipality of Tamiahua,** Ejido Estero de Milpas, 9 July 2014, F. Tapia & D. Jarvio 3171-B (XAL).

PLATE 3. ***Hymenochaete paucisetigera*** A. basidiospores; B. hyphidia; C. basidia; D. generative and skeletal hyphae; E. setae. ***Thelephora dentosa*** F. basidia; G. basidiospores; H. generative hyphae. Scale bars: A–D = 4 µm; E = 6.5 µm; F–H = 5.5 µm.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Remarks—Although *Hymenochaete paucisetigera* was originally described in *Hydnochaete* by Parmasto & Wu (2005), morphological and sequence analyses by He & Dai (2012) demonstrated that the species is phylogenetically more closely related to *Hymenochaete*.

Hymenochaete paucisetigera, which is diagnosed primarily by its effused-reflexed to pileate basidiocarp and very rare setae, may be confused with *H. asetosa* (Y.C. Dai) S.H. He & Y.C. Dai, which differs by its larger (5–6 × 2.8–3.3 µm) basidiospores and the absence of setae (Dai 2010, as *Hydnochaete asetosa* Y.C. Dai). Macroscopically, *H. paucisetigera* is also very similar to *Hymenochaetopsis tabacinoides* (Yasuda) S.H. He & Jiao Yang, which differs by its abundant setae and a predominantly pileate basidiome and rarely effused-reflexed (Dai, 2010 as *Hydnochaete tabacinoides* (Yasuda) Imazeki). The Mexican material agrees with the descriptions of *H. paucisetigera* (previously known only from Taiwan on dead *Carpinus* sp. trees) by Parmasto & Wu (2005) and Dai (2010). Tapia & al. (2016) listed Mexican records of three hydnoid *Hymenochaete* species; our new record of *H. paucisetigera* adds a fourth.

Thelephora dentosa Berk. & M.A. Curtis, Journal of the Linnean Society, Botany 10: 329 (1868 [“1869”]) Plates 1e–f; 3f–h

Basidiome initially encrusting with irregular shapes (sometimes rhizomorphic) or easily separable patches, developing erect or oblique processes (0.2–5 × 0.2–3.5 cm) that are narrowly clavarioid, ramiform, or spathulate, often with subulate lobes (both processes and lobes regularly present); stipe 0.3–2 × 0.1–0.2 cm. Hymenium amphigenous. Hymenophore smooth to finely velutinous, dark brown to brownish umber with purplish tinge, slightly to distinctly cyanescent in KOH. Flesh thin, soft, beige to pallid brown.

Hyphal system monomitic; generative hyphae with clamp connections, thin to slightly thick-walled, sometimes branched, interwoven, 3–6(–7) µm diam, walls colorless or pale brown. Hymenium slightly to distinctly cyanescent in KOH. Cystidia none, but cystidioid lageniform elements (19–36 × 4.5–7.5 µm) sometimes present. Basidia 40–65 × 8–10 µm, clavate to subclavate, sometimes subcylindrical, 4-spored, clamped, often yellowish to hyaline in KOH. Basidiospores 7–8(–9) × 6.5–8 µm, yellowish brown, subglobose or broadly ellipsoid, each with a blunt apiculus, echinulate with 1-µm long spines.

Habitat—On dead twigs and leaves and encrusting parts of living plants in tropical deciduous forest; 4–25 m asl.

Specimens examined—**MEXICO, Veracruz State, Municipality of Tamiahua,** Ejido Estero de Milpas, 7 July 2014, F. Tapia & D. Jarvio 3125; 3126 (XAL); 9 July 2014, F. Tapia & D. Jarvio 3179 (XAL).

Remarks—The Mexican specimens match perfectly with descriptions of *Thelephora dentosa* by Burt (1914), Corner (1968), Welden (1968), and Stalpers (1993). This species is characterized by its resupinate growth (or resupinate with more or less clavarioid excrescences), subglobose basidiospores, and hymenium that is cyanescent in KOH. Immature basidiomata of *T. dentosa* found only on encrusting leaves and twigs and lacking clavarioid processes, might be confused with *T. atra* Weinm., *T. crustacea* Schumach., *T. spiculosa* (Fr.) Fr., and *T. penicillata* (Pers.) Fr., all species that differ in having basidiospores larger than 9 µm (Corner 1968, Stalpers 1993). Temperate species with stereoid basidiomata (e.g., *T. terrestris* Ehrh., *T. griseozonata* Cooke) have also been reported to adhere to living plant matter (Cunningham 1957, Corner 1968, Watling 1996).

In Jalisco, Mexico, Ramírez-López & al. (2013), who studied the phenotypic variations of a *Thelephora* sp. exhibiting the same growth as *T. dentosa*, showed that developing or growing clavarioid basidiomata can become resupinate when in contact with rocks, leaf litter, or live plants, sometimes forming groups of up to 139 basidiomata over an area of 30 m^2.

Thelephora dentosa is known from Cuba, Haiti, and Jamaica (Burt 1914, Welden 1968, Corner 1968); here it is recorded for the first time in Mexico.

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